



Self-Efficacy and Test Anxiety as Predictors of Academic Performance of Biology Students in Senior Secondary Schools

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Abstract

This study examined the roles of self-efficacy and test anxiety as predictors of academic performance among Senior Secondary School Biology students in Ijebu-Ode, Ogun State. A descriptive research design was used, with 600 students selected through simple random sampling from ten schools. Data was collected using a self-designed close-ended questionnaire. This study results revealed high self-efficacy and low test anxiety levels among the students, with no significant gender differences in self-efficacy and test anxiety, although females exhibited higher levels overall. No significant differences were found in these factors based on students' age. However, students from educated backgrounds displayed higher self-efficacy. A significant positive relationship was found between self-efficacy and academic performance ($r = 0.315$; $p = 0.000$), while test anxiety showed no significant relationship with academic performance ($r = 0.018$; $p = 0.669$), though it did correlate with self-efficacy. The regression model confirmed that self-efficacy had a significant impact on academic performance ($p = 0.000$). Based on these findings, the study recommends initiatives to boost self-efficacy, greater parental involvement in education, and strategies to reduce test anxiety. Future research should focus on the long-term effects of self-efficacy on academic outcomes and the effectiveness of interventions addressing Self-efficacy and test anxiety in diverse student populations.

Keywords: Self-efficacy, Test anxiety, Academic performance, Biology students, Teaching strategy

INTRODUCTION

Academic performance, particularly in demanding subjects like biology, is often influenced by a combination of cognitive and psychological factors. Among these factors, self-efficacy and test anxiety are recognized as significant predictors that can either enhance or hinder students' academic outcomes. For Nigerian secondary school students in both the sciences and arts, biology remains one of the most popular science subjects. The study of life

and living organisms, including their physical structure, chemical processes, molecular interactions, physiological systems, development, and evolution, is known as natural science (Ihekwoaba *et al.* 2020). It examines the functioning, evolution, and interactions of living organisms and its numerous species, including humans. Advances in the fields of biology, such as biotechnology, medicine, agriculture have improved the quality of human life. Due to its significance and applications, biology has become an important subject in secondary education.

Studies in the fundamental fields of biology, such as genetics, evolution, physiology, ecology, molecular biology, microbiology, and biochemistry have led to numerous significant advances in our way of life. Although biological concepts are

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introduced at the elementary school level, biology is taught as a separate subject at secondary school level. Researchers such as Mbaegbu, (2020) and Ezenwabachili and Okoli (2021) have expressed concern about the factors influencing students' academic performance in biology. Numerous factors, particularly the teaching strategies used by biology teachers, have been linked to the fluctuating achievement of students in the subject and the drop in enrolment (Mbaegbu, 2020). Many studies including those conducted by Irede and Okoli (2019); Onu *et al.* (2020) have explained different teaching approaches aimed at improving students' achievement in Biology. However, these studies have not shown significant improvement in students' performance. Hence, researchers are interested in understanding the persistent pattern of inconsistent academic performance and the decline in enrolment in science subjects like biology.

Self-efficacy, defined by Bandura (1997) refers to an individual's belief in their ability to succeed in specific tasks, influences behaviour, thinking, and motivation. It reflects the conviction that one can achieve desired outcomes through personal efforts. This belief shapes how people approach tasks, their determination to complete them, and the effort they invest. Individuals with high self-efficacy tend to work harder, overcome obstacles, and persist in the face of difficulties, while those with low self-efficacy often avoid challenges and may give up easily (Bandura, 1997). Self-efficacy therefore plays a critical role in how individuals set goals, tackle tasks, and respond to challenges. Individuals with high self-efficacy are more likely to set ambitious goals, work diligently toward them, and persevere despite setbacks. On the other hand, those with low self-efficacy are more likely to avoid difficult tasks and struggle with motivation. In educational settings, Schunk (1989) emphasizes that self-efficacy is a key determinant of academic motivation and performance. Students who believe in their abilities are more likely to engage actively in learning activities, invest effort in their studies, and achieve better academic results.

The implications of self-efficacy extend beyond individual behaviour to areas such as health, education, and organizational settings. In health psychology, for instance, individuals with high self-efficacy are more likely to

engage in health-promoting behaviours, such as exercising regularly or adhering to treatment regimens. Research has shown that self-efficacy plays a crucial role in managing chronic diseases as individuals, who believe in one's ability to manage symptoms can lead to better health outcomes. In educational contexts, fostering self-efficacy among students is vital. Teachers can implement strategies such as setting achievable goals, providing constructive feedback, and creating a supportive learning environment to enhance students' self-efficacy. These strategies can improve academic performance and a greater willingness to engage with challenging learning materials. In the workplace, self-efficacy can influence job performance, employee motivation, and team dynamics. Employees who believe in their capabilities are more likely to take initiative, engage in problem-solving, and contribute positively to team efforts. Organizations can benefit from fostering a culture that encourages skill development, recognizes achievements, and provides constructive feedback. Self-efficacy is a powerful construct that affects various aspects of human behaviour and motivation. By understanding and enhancing self-efficacy, individuals can improve their ability to face challenges, achieve their goals, and ultimately lead more fulfilling lives. As Bandura (1997) suggests, cultivating self-efficacy is essential for fostering resilience and achieving success across different life domains. Test anxiety is another important psychological factor that influences students' academic performance.

Test anxiety is defined as a sensation of unease or apprehension preceding, during, or following a test due to worry or fear (Shokrpour *et al.*, 2011). It affects persons of all ages who are tested, assessed, and graded based on their abilities or achievements. High cognitive test anxiety has been linked to poor achievement in research, although it may also result in otherwise excellent achievement due to its relationship to motivation. The relationship between self-efficacy and test anxiety is well-documented in educational psychology literature. Students with high self-efficacy has been found to mitigate the effects of test anxiety, as they are confident in their abilities and are less likely to experience debilitating levels of anxiety during exams (Mega *et al.*, 2014). This inverse relationship suggests that interventions aimed at increasing self-efficacy

could also reduce test anxiety, thereby improving students' academic performance.

Putwain and Daniels (2010) explored this dynamic further, revealing that students with low self-efficacy are more prone to experiencing test anxiety, which in turn negatively affects their academic outcomes. This finding underscores the importance of fostering self-efficacy in students, particularly in challenging subjects like biology, to help them manage anxiety and perform to their full potential. Test anxiety is a common psychological condition that significantly impacts students' academic performance. It is characterized by excessive worry and fear about test outcomes, often leading to emotional, physical, and cognitive symptoms that hinder students' ability to perform well. The fear of failure, driven by internal and external pressures such as personal goals and expectations from parents and teachers, is a major contributor to test anxiety (Zeidner, 1998). High-stakes tests, such as standardized exams or final assessments, can amplify this pressure, creating stress that interferes with cognitive functions like concentration and memory recall (Cassady & Johnson, 2002; Sarason, 1984). Understanding the causes and effects of test anxiety is crucial for developing effective strategies to help students manage stress and improve academic performance.

Test anxiety manifests in emotional, physical, and cognitive symptoms, including feelings of dread, rapid heartbeat, sweating, and difficulty concentrating. These symptoms negatively impact test performance by impairing focus and memory retrieval (Cassady & Johnson, 2002). High anxiety levels are linked to lower test scores, even when students have adequately prepared, as anxiety often disrupts their ability to recall information (Putwain & Symes, 2011). Additionally, studies show that self-efficacy plays a key role in mitigating the negative effects of test anxiety. Students with higher self-efficacy experience less anxiety and perform better academically, highlighting the importance of boosting students' confidence in their abilities to manage anxiety and improve test outcomes (Barrows *et al.*, 2013; Perepiczka *et al.*, 2011). Addressing test anxiety and fostering self-efficacy can significantly enhance both academic achievement and student well-being.

STATEMENT OF THE PROBLEM

Despite the importance of biology education in senior secondary schools, students' academic performance in this subject remains a concern. Research suggests that self-efficacy and test anxiety are critical psychological factors that influence academic achievement. However, the specific relationships between self-efficacy, test anxiety, and academic performance in biology among senior secondary school students are not well understood. Biology is one of the most significant subjects in secondary education for students who wish to pursue future careers in health sciences and related areas, yet unfortunately this discipline continues to be problematic because many students still perform poorly.

This lag is not only a question on intelligence or knowing capacity but also implies psychological factors as self-efficacy and test-anxiety. Powerful evidence supports the belief that the faith in achievement on given activities (self-efficacy) largely impacts academic success. Students with high self-efficacy are more likely to use effective study techniques, persist through difficult material and earn top grades. However, when students deeply troubles with low self-efficacy in subjects like biology they become disengaged and this shows up in their academic accomplishments.

This study therefore provides further clarification by examining the influence of self-efficacy and test anxiety on academic performance in biology among senior secondary school students. Identifying these patterns is essential to informing the development of interventions with which to better student outcomes in biology, ultimately leading toward improvements among educational practices and policies.

Aim and Objectives of the Study

The aim of this study is to determine the self-efficacy and test anxiety as predictors of academic performance of biology students in senior secondary schools.

Research Questions

1. What are the levels of self-efficacy and test anxiety of secondary school biology students?
2. What are the levels of secondary school biology students' self-efficacy and test anxiety based on gender, age and parents' educational background?
3. What are the relationships among secondary school biology students' self-efficacy, test anxiety and academic performance of students?
4. What are the impacts of secondary school biology students' self-efficacy and test anxiety on the students' academic performance?

METHODOLOGY

Research Design

The study adopted a descriptive correlational survey research design.

Population of the Study

The population of the study consisted of all senior secondary school one (SSS 1) biology students in Ijebu Ode Local Government Area of Ogun State.

Sample and Sampling Technique

Purposive sampling technique was used to select 10 secondary schools. 130 lotteries were prepared containing 60 "YES" and 70 "NO".

All students were allowed to pick one lottery each where those who picked the "YES" lotteries were selected, while those who picked the "NO" lottery were not allowed to take part in the study. Therefore, a total of 600 students were randomly selected.

Research Instrument

The instrument used for data collection is questionnaire adapted from Bandura (1997) - Self-Efficacy and Test Anxiety Questionnaire. It consisted three sections. Section A contains socio-demographic characteristics of respondents. Section B had forty-five (45) items on self-efficacy having 4-Likert scales (Strongly Agree - SA, Agree -A, Disagree - D and Strongly Disagree - SD), while section C had fifteen (15) items on test anxiety with 4-Likert scales as well. However, students' academic performance was operationalized as the students' second-term exam results in Biology. These results were obtained from the schools' records and served as a concrete measure of how well students performed in the subject.

Validity and Reliability of Instrument

The instrument (questionnaire was drafted and allowed to be face and content validated by education experts in the Department of Biological Sciences, Tai Solarin University of Education, Ijagun, Ogun State, Nigeria.

The reliability of the instrument was determined by administering 60 questionnaires to students who were not part of the target population, as pilot study. The Cronbach Alpha analysis was used to analyse the data generated and coefficients of 0.921 and 0.715 were obtained for self-efficacy and test anxiety respectively.

Data Analysis

Frequency tables including simple percentage were used in the analysis of the data collected from the field. However, data collected were analysed using descriptive statistics involving mean, frequency and percentage, Also, inferential statistics involving t-test, ANOVA, chi-square, the regression statistics was used. The analysis was carried out using Statistical Package for Social Sciences (SPSS) version 24.

Table 1. Socio-demographic characteristics of respondents.

		Frequency	Percentage
Gender	Male	218	36.3
	Female	382	63.7
Age	12-14 years	161	26.8
	15-17 years	415	69.2
	18-20 years	22	3.7
	Above 20 years	2	0.3
Parents' educational background	Educated	484	80.7
	Non-educated	116	19.3
Birth position in the family	First birth	214	35.7
	Second birth	156	26.0
	Third birth	119	19.8
	Fourth birth	59	9.8
	Fifth birth	44	7.3
	Above Fifth birth	8	1.3

Table 2. Levels of students' self-efficacy and test anxiety.

Variables	Minimum	Maximum	Mean	Std. Deviation	Remark
Self-efficacy	89	180	144.42	18.08	High
Test anxiety	21	79	43.86	8.01	Low

Table 3. Levels of students' self-efficacy and test anxiety based on gender

Variables	Gender	Mean	Std. Deviation	Sig.
Self-efficacy	Male	143.28	17.41	0.240
	Female	145.08	18.44	
Test anxiety	Male	43.72	7.95	0.459
	Female	44.34	8.29	

Table 4. Levels of students' self-efficacy and test anxiety based on age.

Variables	Age	Mean	Std. Deviation	Sig.
Self-efficacy	12-14 years	144.47	17.64	0.054
	15-17 years	144.92	18.28	
	18-20 years	137.05	15.41	
	Above 20 years	120.00	12.72	
Test anxiety	12-14 years	43.13	8.40	0.287
	15-17 years	44.07	7.94	
	18-20 years	45.64	6.26	

	Above 20 years	38.00	0.00	
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Table 5. Levels of students' self-efficacy and test anxiety based on parental education background

Variables	Parental education background	Mean	Std. Deviation	Sig.
Self-efficacy	Educated	145.27	17.63	0.019
	Non-educated	140.91	19.53	
Test anxiety	Educated	43.72	7.95	0.399
	Non-educated	44.42	8.30	

Table 6. Relationship among students' self-efficacy, test anxiety and academic performance.

Variables	Self-efficacy	Test anxiety	Academic performance
Self-efficacy			
Test anxiety	0.191**		
Academic performance	0.315**	0.018	

**Variables are significant at $p \leq 0.01$

Table 7. Impact of students' self-efficacy and test anxiety on their academic performance.

Model	Unstandardized Coefficients $R^2 = 0.101$; $F_{2, 597} = 33.48$; $p = 0.000$		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Self-efficacy	0.285	0.035	0.323	8.170	0.000
Test anxiety	-0.088	0.079	-0.044	-1.122	0.262

RESULTS AND DISCUSSION

Results

Table 1 shows the socio-demographic characteristics of the respondents used in this study. There were 218 (36.3%) male students and 382 (63.7%) female students in the study. This means that female students were much more than their male counterparts. Also, 161 (26.8%) students were in the age category of 12-14 years, while 415 (69.2%) of the students were in the age category of 15-17 years. However, those in the 18-20 years category were 22 (3.7%), while only 2 (0.3%) were above 20 years of age. This indicates that the largest proportion of the students were in the age category of 15-17 years. Furthermore, students who had educated parents were found to be 484 (80.7%), while those whose parents were non-educated were 116 (19.3%). However, this study found students of first birth to be 214 (35.7%), second birth to be 156 (26.0%) and those of third birth were 119 (19.8%). Also, students of fourth and fifth birth were 59 (9.8%) and 44 (7.3%), respectively. Meanwhile, this study found those who were of above fifth birth to be 8 (1.3%). This implies that students of first and second births were the most abundant in the sample of the study.

Presented in Table 2 are the levels of self-efficacy and test anxiety of the students of biology in secondary schools. This study found that for students' self-efficacy, the minimum and maximum were 89 and 180, respectively, of which the calculated midpoint was 134.5. The students' mean self-efficacy was found to be 144.42 ± 18.08 , which is higher than the calculated midpoint. Therefore, the students' self-efficacy was said to be high. Furthermore, the students' test anxiety was found to have minimum and maximum values of 21 and 79, respectively, of which the calculated midpoint was 50. The students' mean test anxiety was found to be 43.86 ± 8.10 , which is lower than the calculated midpoint. Therefore, this study found the students' level of test anxiety to be low.

Table 3 presents the levels of students' self-efficacy and test anxiety based on their gender. This study found a non-significant difference between male and female students' levels of self-efficacy ($p = 0.240$). However, it was discovered that female students had relatively higher (145.08 ± 18.44) self-efficacy in comparison to their male counterparts (143.28 ± 17.41). Furthermore, for

test anxiety of the students, this study found that female students had relatively higher (44.34 ± 8.29) test anxiety than their male counterparts (43.72 ± 7.95). However, there was no statistically significant difference ($p = 0.459$) in the test anxiety of the students based on their gender.

Table 4 shows the levels of self-efficacy and test anxiety of biology students based on age. This study found no significant difference among the students' age categories in terms of their self-efficacy ($p = 0.054$). However, students' self-efficacy was found highest among students that were in the 15-17 years category (144.92 ± 18.28), while lowest among students that were above 20 years of age (120.00 ± 12.72). Students in the 12-14 years and 15-17 years age categories were found to have self-efficacy of 144.72 ± 17.64 and 137.05 ± 15.41 , respectively. This shows that students who are most abundant in the respondents also had the highest self-efficacy as they were likely to be in the main or most acceptable age of their class of study; neither too young nor too old for the class of study. Furthermore, this study also found students' test anxiety to be highest among those in the 18-20 years age category (45.64 ± 6.26), while the least existed among those in the above 20 years age category (38.00 ± 0.00). However, students in the 12-14 years and 15-17 years age categories had test anxiety of 43.13 ± 8.40 and 44.07 ± 7.94 , respectively. Meanwhile, the difference in the mean test anxiety were not found to be statistically significant ($p = 0.287$).

Table 5 shows the levels of self-efficacy and test anxiety of secondary school biology students based on their parents' educational background. This study found a significant difference ($p = 0.019$) between the self-efficacy of the students based on their parents' educational background. It was discovered that students with educated parents had higher self-efficacy (145.27 ± 17.63) than those with non-educated parents (140.91 ± 19.53). This implies that parents' educational background can contribute to children's intrinsic ability in their academics. However, the difference in the students' test anxiety by parents' educational background was found not to be statistically significant ($p = 0.399$). However, higher test anxiety was found among students with non-educated parents (44.42 ± 8.30), while students with educated parents had test anxiety of 43.72 ± 7.95 .

Table 6 shows the relationship among secondary school biology students' self-efficacy, test anxiety and academic performance. This study found a high, positive and significant relationship between students' academic performance and their self-efficacy ($r = 0.315$; $p = 0.000$). This implies that increase in self-efficacy leads to higher academic performance of students. Also, this study found a low but non-significant relationship between students' academic performance and their test anxiety ($r = 0.018$; $p = 0.669$). Furthermore, there existed a positive and significant relationship between students' self-efficacy and test anxiety ($r = 0.191$; $p = 0.000$).

Table 7 shows the interactive effects of secondary school biology students' self-efficacy

and test anxiety on their academic performance. This study found that students' self-efficacy had positive and significant impact on their academic performance ($\beta = 0.323$; $t = 8.170$; $p = 0.000$). This implies that a unit increase in students' self-efficacy resulted in 0.323 (32.3%) increase in the students' academic performance. It was also discovered that students' test anxiety had negative and non-significant impact on their academic performance ($\beta = -0.044$; $t = -1.122$; $p = 0.262$). Furthermore, the regression model shows R^2 value as 0.101; indicating that students' self-efficacy and test anxiety accounted for 10.1% of the variance in the academic performance of the students. However, the model was found to be statistically significant ($F_{2, 597}^* = 33.48$; Sig. = 0.000; $R^2 = 0.101$).

Discussion

The results of this study reveal a higher proportion of female students compared to male students, which aligns with broader trends in educational enrolment, particularly at the secondary school level (UNESCO, 2020). Most participants fell within the typical age range for secondary education, underscoring the developmental significance of this stage for both academic and personal growth.

The study found high levels of self-efficacy among students and low levels of test anxiety. This finding supports Bandura's self-efficacy theory suggesting that students with greater confidence in their abilities are better able to handle academic stress, including test-related anxiety. This is further supported by the positive relationship observed between self-efficacy and academic performance (Schunk & Zimmerman, 2008). However, although no significant gender differences were observed in self-efficacy or test anxiety, female students showed a slight trend towards reporting higher levels of both. This indicates that while females may experience more anxiety, they may also have higher self-confidence in their academic abilities, which mirrors findings in other studies that suggest females often develop more effective coping strategies for academic challenges (Eagly & Wood, 1999).

The analysis of age differences found no significant variations in self-efficacy or test anxiety across different age groups. This suggests that these psychological constructs may stabilize as students' progress through their secondary education. Notably, the students in the 15-17years age-category

exhibited the highest self-efficacy, which could reflect a period of increased academic engagement. The absence of significant age-related differences in test anxiety supports previous research that suggests test anxiety does not necessarily increase with age (Putwain, 2007).

Additionally, the study revealed a significant relationship between self-efficacy and parental education level, suggesting that socio-economic factors, such as parental involvement and education, play an important role in shaping students' academic confidence. Students with more highly educated parents tended to report higher levels of self-efficacy, which supports existing literature emphasizing the impact of parental background on student success (Hill & Tyson, 2009). On the other hand, test anxiety did not significantly differ based on parental education, suggesting that anxiety may be influenced by other factors, such as peer interactions or the broader school environment.

Finally, the relationship between self-efficacy and academic performance was found to be positive, confirming that students with higher self-efficacy tend to perform better academically (Zimmerman, 2000). In contrast, the study found no significant relationship between test anxiety and academic performance, suggesting that while anxiety is common, it does not necessarily hinder students' ability to succeed academically (Zeidner, 1998). Regression analysis further confirmed that self-efficacy is a significant predictor of academic performance, while test anxiety had little to no impact. This finding

highlights the importance of fostering self-efficacy as a means of improving academic outcomes, suggesting that interventions aimed at boosting students' belief in their abilities may be more effective than focusing solely on reducing test anxiety.

CONCLUSION

This study established that self-efficacy is a significant predictor of academic performance among secondary school Biology students. Students with higher self-efficacy demonstrated better academic outcomes, highlighting the importance of fostering positive academic beliefs. The lack of significant gender differences in self-efficacy indicates that educational strategies can be broadly applied, although attention should still be paid to fostering an inclusive environment that addresses individual student needs. Additionally, the impact of age on self-efficacy suggests that specific interventions may be required for different age groups to optimize their learning experiences. In conclusion, the results indicate that students exhibit high self-efficacy and low test anxiety, both of which are positive predictors of academic performance. The significant influence of parental education on students' self-efficacy levels underscores the necessity of supportive home environments. Although some variations in self-efficacy and test anxiety were observed across demographic factors, the overall findings suggest that students are well-equipped to face academic challenges.

RECOMMENDATIONS

Based on these findings, several recommendations can be made:

1. Schools should implement structured programs designed to boost students' self-efficacy such as mentorship initiatives, goal-setting workshops, and peer-support systems.
2. Teachers should set achievable goals for students, utilize positive reinforcement and reward systems. Also, they should encourage their students to have the growth mind-set. Furthermore, teachers should consciously create a supportive classroom environment and provide clear instructions before and during tests.
3. Increasing parental involvement in educational processes is vital. Schools

should create opportunities for parents to engage in their children's education, providing them with resources and knowledge to support their children effectively.

4. Schools should maintain initiatives that promote low levels of test anxiety through regular formative assessments and constructive feedback, preparing students for formal examinations while minimizing stress.
5. Future studies should explore the long-term impacts of self-efficacy on academic performance and investigate the effectiveness of various educational interventions in improving both self-efficacy and test anxiety among diverse student populations

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